

LEARNING OBJECTIVES:

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| | 2.14.01 | List the three factors which determine the actions taken in decontamination of personnel. |
| ☞ | 2.14.02 | List the preliminary actions and notifications required by the RCT for an individual suspected to be contaminated. |
| ☞ | 2.14.03 | List the actions to be taken by the RCT when contamination of clothing is confirmed. |
| ☞ | 2.14.04 | List the actions to be taken by the RCT when skin contamination is confirmed. |
| ☞ | 2.14.05 | List the steps for using decontamination reagents to decontaminate personnel. |

INTRODUCTION

In our work environment, one of the major concerns of radiological control is the prevention of personnel contamination. When personnel contamination has been identified, it is the responsibility of the RCTs to perform or oversee the decontamination of the individual using the best methods available. Frequently, the RCT is also required to document the decontamination effort and make any required notifications. This lesson will address the methods used to detect personnel contamination. In addition, it will address the factors which determine decontamination actions, the responsibilities of the RCTs and the approved methods for decontamination of personnel.

PERSONNEL CONTAMINATION

The potential for personnel contamination is normally monitored via one of the following methods:

External Contamination

- Hand Held Count Rate Meters
- Partial Body Monitors
- Personnel Contamination Monitors.

Internal Contamination

- Whole Body Counts
- Bioassay Samples.

When monitoring for external contamination, hand held count rate meters may be used in one of two ways. Personnel may survey themselves for contamination, or allow radiological control personnel to conduct the survey for them. The majority of external contamination surveys are completed using hand held count rate meters.

Another method of surveying for external contamination is using some type of contamination monitoring machine. Two basic types of monitors exist, partial body monitors and whole body monitors. Partial body monitors, such as hand-and-shoe monitors, a half body monitor, or a portal (walk through) monitor, monitor only a portion of the body. As such, partial body monitors should only be utilized for spot-checking for personnel contamination. To conduct a whole body survey, a personnel contamination monitor that surveys the entire body should be used.

Internal contamination may be monitored in one of two ways. The first method includes whole body counts and specific organ counts (lungs, thyroid, etc.). This type of internal monitoring is called *in vivo*. The other type of internal contamination monitoring uses some sample from the person to determine the presence of contamination. Methods may include urinalysis, fecal analysis, blood sampling and others. These methods are called *in vitro*.

In some cases, the presence of contamination on a worker will be assumed based on the work situation. The following list provides some examples of work situations that may result in personnel contamination.

- Exposure of the worker to known contaminated liquids
- Exposure of the worker to airborne contamination without proper respiratory protection.
- Improper work practices within removable contamination areas such as:
 - Improper removal of protective clothing or devices
 - Improper work practices with contaminated materials
 - Failure to follow radiological control requirements set for work being performed

- Unknowingly working with material discovered to be contaminated.

2.14.01 List the three factors which determine the actions taken in decontamination of personnel.

BASIC FACTORS AFFECTING DECONTAMINATION

Once the RCT determines the worker is contaminated, the actions taken will be controlled by three basic radiological control factors. These factors include:

- Physical condition of the worker
- Location of the contamination on the worker
- Activity of the nuclide(s) present.

Primary consideration should be given to the physical condition of the worker. All actions taken by the RCT will be based on the workers physical condition. The major concern should be whether or not the worker has a serious injury. When a worker sustains a serious injury, the primary concern is the first aid or assistance the worker needs. When a worker sustains an injury, the extent of the injury needs to be determined. Conditions that should be investigated include open/puncture wounds, bruises, sprains, strains and fractures.

Once the physical condition of the worker has been identified, the location of the contamination needs to be determined. Questions requiring particular attention to answer include:

- Is contamination localized on general skin surface?
- Is contamination located on or near a body orifice?
- Is contamination located near a break in the skin?
- Is there a skin condition present in the vicinity of the contamination?
- Is the contamination on the clothing?

Finally, the amount and type of contamination needs to be determined. This will include a determination of the type of activity (alpha, beta or gamma) and saving some type of sample for laboratory analysis.

2.14.02 *List the preliminary actions and notifications required by the RCT for an individual suspected to be contaminated.*

SUSPECTED CONTAMINATION

(Insert site specific material here)

When an RCT is notified of a contaminated or potentially contaminated individual, the individual should be told to remain where they are and the following actions should be accomplished.

Obtain Instruments and Proceed To Location: The RCT should obtain the necessary instrumentation and proceed to the location of the individual with suspected contamination.

Assess Conditions: Arriving at the location, the RCT should make a quick assessment of the condition of the individual and the possibility spreading contamination. If injury is evident, the RCT must immediately notify, or designate someone to notify, the Radiological Control supervisor. If the individual is not injured, a preliminary survey will give the RCT a quick indication of the extent and locations of contamination that may be present. This quick assessment is to determine the immediate course of action and whether additional help is needed or an emergency must be declared.

While performing the assessment survey, the RCT may question the individual to gain information regarding the event that may have caused the contamination. The RCT may elect to notify the Radiological Control supervisor to ask for additional support if, in the judgement of the RCT, the support is needed. For events where there is cause to believe an internal deposition may have occurred or there is extensive contamination, a second RCT may necessary to record readings and to take and count smears (including nose blows or nasal smears). Another example of when an RCT could ask for additional support would be if there were indications that contamination control had been lost in an area frequented by other workers. A second RCT might be needed to ensure immediate posting, traffic control, and to investigate the radiological conditions.

High levels of contamination or hot particles found on the skin or clothing during the preliminary survey should be removed immediately to reduce dose. Securely bag and retain particles and other removed contamination for analysis by dosimetry. Actions for lower levels of confirmed contamination on skin or clothing may proceed in a more methodical manner as described below.

Perform A Personnel Survey: After the quick assessment survey, a detailed whole body survey should be performed of the entire exposed surface area (protective clothing if worn, personal clothing and/or skin) for both alpha and beta-gamma contamination. Starting at the head and proceeding to the feet, pay particular attention to the following areas:

contaminated area (if known)
nose and mouth
hands
skin folds
buttocks
knees
feet

Use the following guidelines for the survey:

1. Verify that the instrument is in service (e.g., turn the monitor on, check the battery and source response) set it to the proper scale so that the audio output can be heard during the survey.

The instrument must have also passed a daily source check, and have a calibration date that has not expired.

2. Hold the probe less than 1/2 inch from the surface being surveyed for beta and gamma contamination, and approximately 1/4 inch for alpha contamination. Do not touch the probe to the area being surveyed to preclude contaminating the probe.
3. Move the probe slowly over the surface (approximately 2 inches per second).
4. If the count rate increases during the survey, pause for 5 to 10 seconds over the area to provide adequate time for instrument response.
5. If the count rate increases to a value greater than a pre-established contamination limit or the instrument alarms then the presence of contamination is confirmed. If confirmed, control, decontaminate and/or notify radiological control personnel (while remaining in the area).
6. The whole body survey should take several minutes. Do not hurry the survey. Take all the time necessary to complete the survey.

Using portable or semi-portable count rate type instruments, an individual may receive an unconditional personnel survey release if contamination is not detected while performing an entire body survey.

Notify Appropriate Personnel: If extensive whole body contamination is found or facial contamination is present, Radiological Control should be notified.

Control Contamination: If the contaminated individual must be moved to another location (e.g. hospital or decontamination facility), contain the contamination as much as possible before allowing the person to move by:

1. Removing and bagging shoes and/or covering feet with plastic shoe covers/booties.
2. Covering the hands of the individual with gloves, preferably "Surgical" gloves.
3. Donning a clean set of Anti-C's over contaminated clothes or merely wrapping the individual with any covering.

2.14.03 List the actions to be taken by the RCT when contamination of clothing is confirmed.

CONTAMINATED CLOTHING

(Insert site specific material here)

Clothing contamination should be treated just as seriously as skin contamination until the clothing has been removed and it has been verified that no skin contamination is present. When the clothing of an individual is found contaminated, advise the individual to refrain from moving around or touching the contaminated area and follow the specified procedures for decontamination. At a minimum, the following should be accomplished.

Control Contamination: Contain and remove areas of gross contamination including hot particles by pulling off with tape or cutting out the area and securely bagging the contamination.

Remove Clothing: Carefully remove and securely bag all contaminated clothing. Properly store and save the contaminated clothing worn by the individual for analysis by dosimetry if there is skin contamination or a possible uptake of radioactive material.

Resurvey the Individual: Perform a personnel whole body survey after removal of contaminated clothing to determine that the individual is not recontaminated.

1. If contamination persists consider moving to a decontamination facility.
2. Assess potential for internal deposition (airborne, puncture) by surveying outside and inside of masks, surveying facial area, and taking nose blows or nasal smears.

2.14.04 *List the actions to be taken by the RCT when skin contamination is confirmed.*

SKIN DECONTAMINATION

(Insert site specific material here)

When the skin of an individual is found contaminated, follow the specified procedures for decontamination. Stop the decontamination effort if the skin becomes irritated or the individual complains of discomfort. At a minimum, the following should be accomplished.

Remove High Levels of Contamination: Hot particles and high levels of contamination should be removed as soon as possible. The time spent to determine the activity and area of contamination should be minimized when high doses are possible.

Notify Radiological Control: Notify Radiological Control and other personnel as may be needed for dose assessment and decontamination.

Decontaminate if Appropriate: Determine the condition of the skin (cuts, sores, abrasions, irritations, etc.) and decontaminate if appropriate. Treatment of contaminated skin with skin conditions (including wounds) is usually reserved for medical personnel. Flushing minor wounds with plain tepid water may be permitted.

Whole skin can be decontaminated by wiping with moist towelettes, flushing with plain tepid water, or washing with mild non abrasive soap and tepid water. Tape should only be

used in areas where there is minimal hair and hair can only be trimmed with permission of the individual.

Retain particles or other samples of contamination for analysis and dose assessment by Dosimetry.

Assess the Possibility of Internal Contamination: Assess potential for internal deposition (airborne, puncture) by surveying outside and inside of masks, surveying facial area, and taking nose blows or nasal smears.

DOCUMENTATION

After decontamination has been completed, it is essential that the proper documentation is completed for proper records.

(Insert site specific material here)

Typical documentation includes an estimate of the skin area and location affected and the activity involved. In addition, a description of the decontamination process including levels and iterations is also required.

2.14.05 *List the steps for using decontamination reagents to decontaminate personnel.*

DECONTAMINATION REAGENTS

(Insert site specific material here)

Generally the following applies:

Soaps and detergents emulsify and dissolve contamination and are frequently all that are needed for decontamination of skin. Decon towelettes are also used for minor decontaminating. The first attempts for decontaminating should always begin with the least irritating agent (e.g. soap and water) before proceeding to stronger techniques.

Sweating may also be used to dislodge contamination by applying gloves, wraps, or warm baths.

Sticky tapes may also be used but the potential for irritating the skin must be kept in mind. It is a common mistake to under-estimate the potential for skin irritation until too late. Particular care should be taken on the more sensitive and thin skin areas. At times, if the skin becomes irritated, decontamination may have to wait until the skin heals before proceeding with decontamination.

Stronger and more abrasive soaps (Tide, Clorox, or cornmeal) may dislodge the contamination but are generally used by medical personnel because of their potential for damaging the skin.

Stronger chemical techniques such as those using Potassium Permanganate (KMnO_4), Sodium Bisulfite (NaHSO_3), DTPA (as a wash), or CaDTPA (as a wash) are not often needed, but when they are, they should be used only by trained medical personnel.

SUMMARY

In this lesson we have covered the basic principles of personnel decontamination. Our main subjects are the actions taken in the event of potential personnel contamination, notifications required in the event of personnel injury, proper methods for identification and location of contamination, proper action to be taken once contamination has been confirmed and the approved methods for decontamination of personnel. Also discussed were the types of reagents utilized for personnel decontamination, and the precautions associated with each.

REFERENCES

(Insert site specific references.)